S Upper Clark Fork
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CLARK FORK RIVER
SITE SCREENING STUDY

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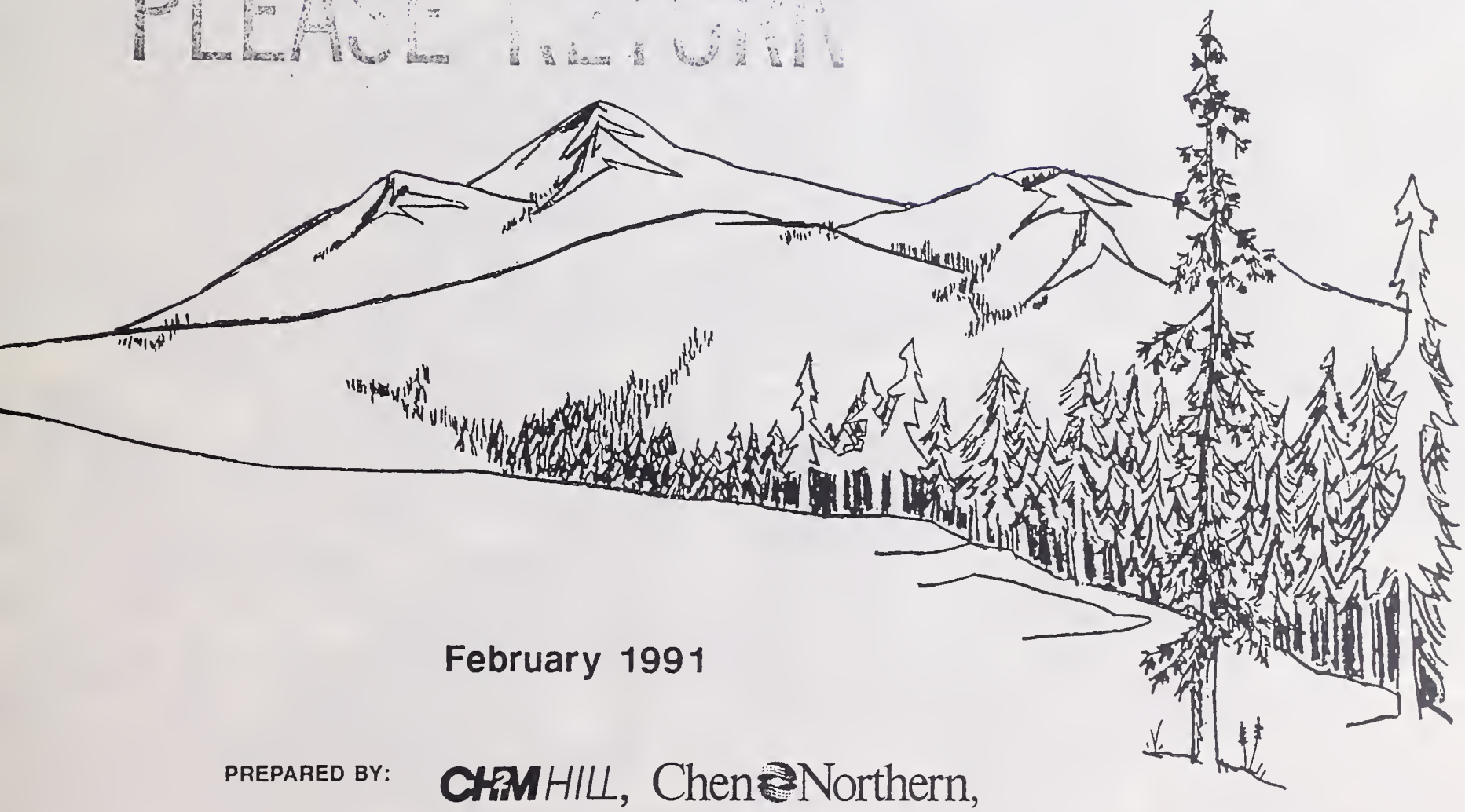

February 1991

PREPARED BY: CH2M HILL, Chen Northern, and Reclamation Research Unit

PREPARED FOR: MONTANA DEPARTMENT OF HEALTH AND ENVIRONMENTAL SCIENCES
HELENA, MONTANA

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DRAFT FINAL

DATA SUMMARY REPORT
UPPER CLARK FORK RIVER SCREENING STUDY

VOLUME III
MAPS AND EXHIBIT

EPA REGION VIII

Prepared for:

Montana Department of Health and Environmental Sciences
Helena, Montana

Prepared by:

CH2M HILL, Inc.
Helena, Montana

Chen-Northern
Helena, Montana

Montana State University
Reclamation Research Unit
Bozeman, Montana

February 28, 1991

Document No. SBC-CFR-SST-D-R1-022891

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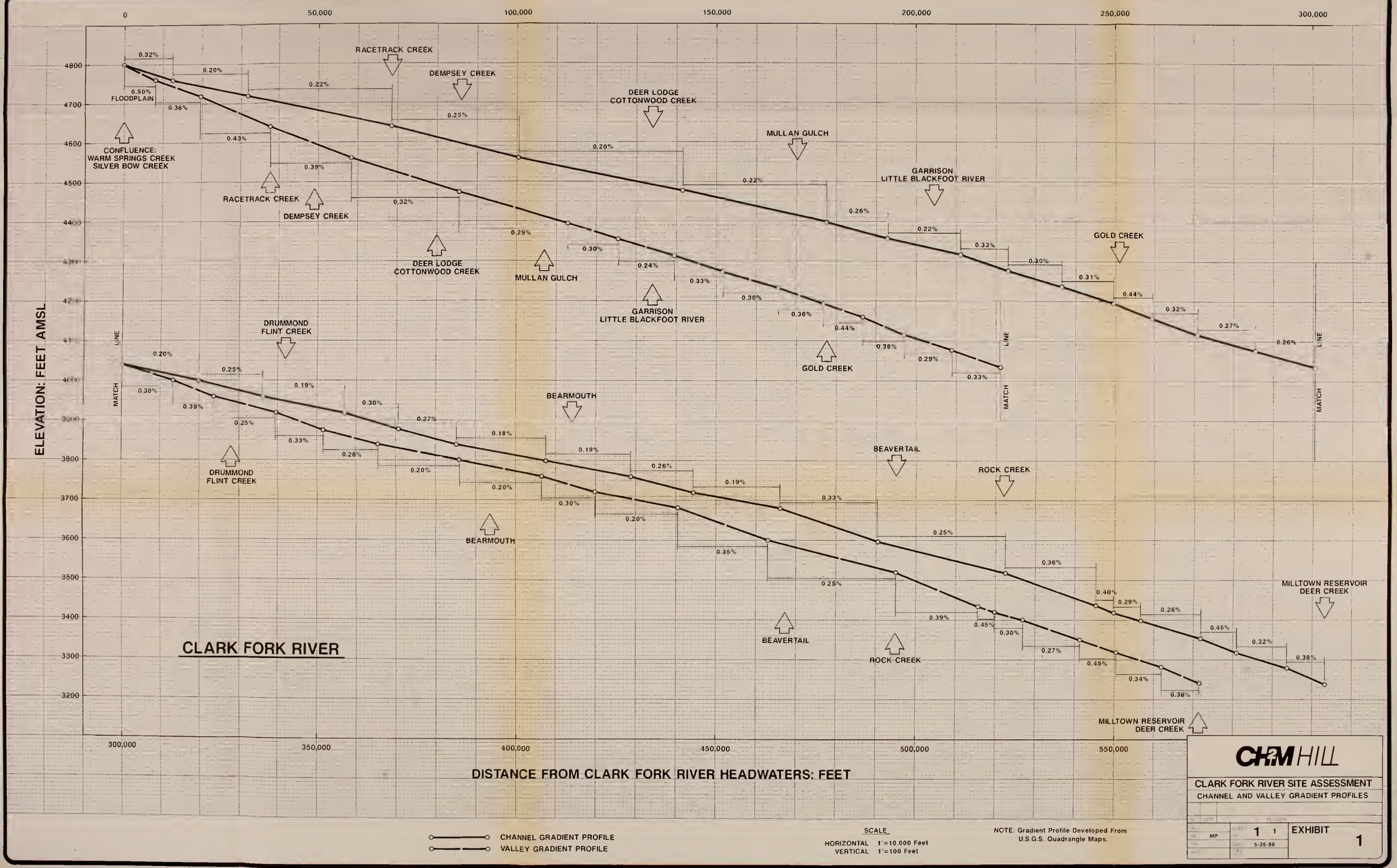
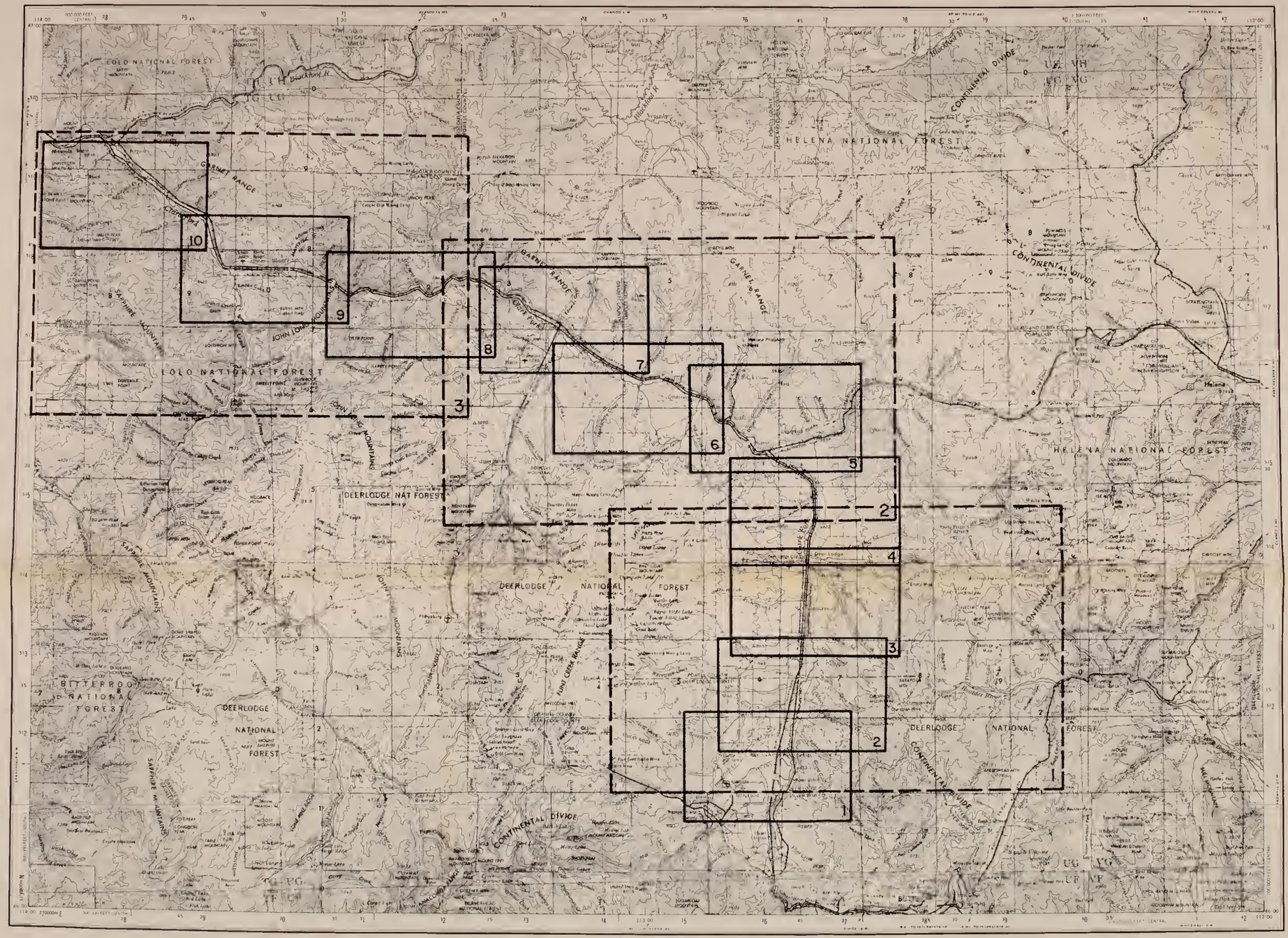


CLARK FORK RIVER
ELEVATION: FEET AMSL
DISTANCE FROM CLARK FORK RIVER HEADWATERS: FEET
0
50,000
100,000
150,000
200,000
250,000
300,000
350,000
400,000
450,000
500,000
550,000
4800
4700
4600
4500
4400
3800
3700
3600
3500
3400
3300
3200
CONFLUENCE: WARM SPRINGS CREEK SILVER BOW CREEK
FLOODPLAIN
RACETRACK CREEK
DEMPSEY CREEK
DEER LODGE COTTONWOOD CREEK
MULLAN GULCH
GARRISON LITTLE BLACKFOOT RIVER
GOLD CREEK
DRUMMOND FLINT CREEK
BEARMOUTH
BEAVERTAIL
ROCK CREEK
MILLTOWN RESERVOIR DEER CREEK
MATCH LINE
CHANNEL GRADIENT PROFILE
VALLEY GRADIENT PROFILE
SCALE
HORIZONTAL 1"=10,000 Feet
VERTICAL 1"=100 Feet
NOTE: Gradient Profile Developed From U.S.G.S. Quadrangle Maps.
CH2M HILL
CLARK FORK RIVER SITE ASSESSMENT
CHANNEL AND VALLEY GRADIENT PROFILES
MP
1 1
5-26-88
EXHIBIT 1



SHEETS 1 - 3
OF MAPS 5,6

Scale 1 62,500

SHEETS 1-10
OF MAP 7

Scale 1: 24,000

Scale 1:250,000

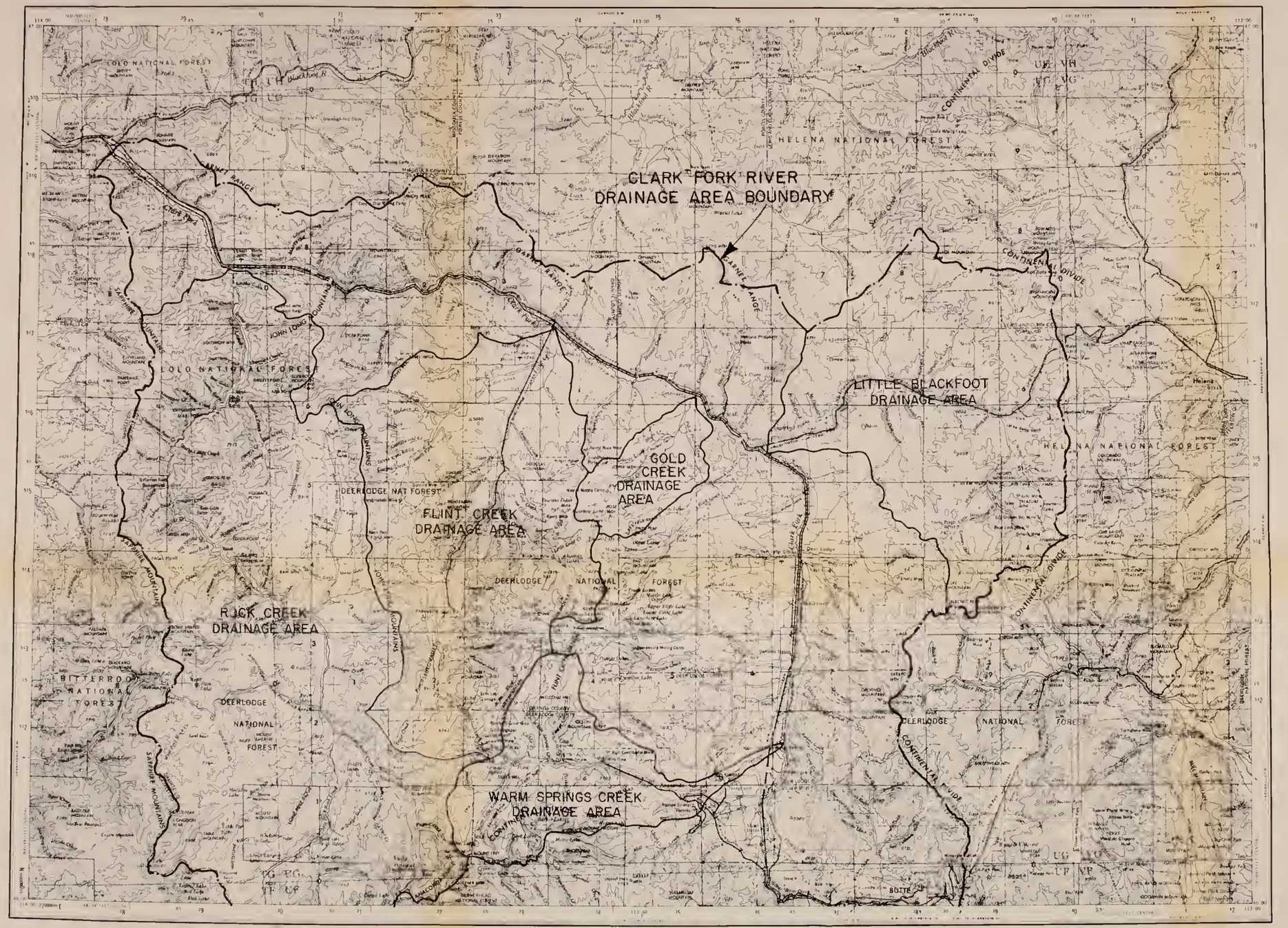
CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS

CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT
INDEX

NO.	DATE	REVISION

DES	SS	SHEET 1 1	MAP 1
DR	MP	OF	
CHK	MG	DATE 5-15-87	
APPD	JG	DWG NO.	



CLARK FORK RIVER DRAINAGE AREA = 3650 sq mi.
(TO ABOVE MILLTOWN)

WARM SPRINGS CREEK ORAINAGE AREA = 182 sq mi

LITTLE BLACKFOOT RIVER ORAINAGE AREA = 428 sq mi

GOLO CREEK ORAINAGE AREA = 67 sq mi

FLINT CREEK ORAINAGE AREA = 486 sq mi

ROCK CREEK ORAINAGE AREA = 885 sq mi

Scale 1 250,000

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS

CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT
DRAINAGE BASINS

NO	DATE	REVISION

DES	SS	SHEET 1 OF 1	MAP 2
DR	MP		
CHK	MG	DATE 5-15-87	
APPD	JG	DWG NO	

Scale 1 250,000

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS

NOTE

Information obtained from Directory of Montono Mining Enterprises for 1984, compiled by D.C. Lowson, Bulletin 122 MBMG.

CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT
MINING DISTRICTS

NO.	DATE	REVISION
DES	SS	SHEET 1 1
DR	MP	OF
CHK	MG	DATE 5-15-87
APPD	JG	DWG NO.

MAP 3

Scale 1:250,000

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100 FOOT INTERVALS

N

EXPLANATION

SURFACE WATER SAMPLING SITES: 1980-86

- ▲ U S GEOLOGICAL SURVEY
- ● SILVER BOW CREEK REMEDIAL INVESTIGATION
- ■ MONTANA DEPT OF FISH, WILDLIFE AND PARKS
- ⬟ MONTANA WATER QUALITY BUREAU

FISHERIES STUDY SITES: 1969-84

- ♦ MONTANA DEPT OF FISH, WILDLIFE AND PARKS

AQUATIC INVERTEBRATE SAMPLING SITES: 1972-84

- ♣ CHADWICK & ASSOCIATES

THERMAL SPRINGS

- \ SONDEREGGER, JOHN L., 1981, OPEN FILE REPORT 142 MONTANA BUREAU OF MINES AND GEOLOGY, BUTTE, MONTANA

CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT

SAMPLING LOCATIONS & GEOTHERMAL SPRINGS

NO	DATE	REVISION
DES	SS	SHEET 1 1
DR	MP	OF
CHK	MG	DATE 5-15-87
APPD	JG	DWG NO.

MAP 4

EXPLANATION

- ▲ PRIVATE CAMPGROUND
- △ STATE RECREATION AREA
- ● STATE FISHING ACCESS SITE
- ○ PUBLIC RECREATION AREA (OTHER THAN STATE)
- □ INTERSTATE 90 REST AREA
- ■ HISTORIC SITE
- ◊ PROPOSED RECREATION AREA
- ⬟ WATERFOWL MANAGEMENT AREA / FISHING ACCESS MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
- ◯ AREAS WITH POPULATION DENSITIES GREATER THAN 20 PERSONS
- STATE OR FEDERAL LANDS AVAILABLE FOR PUBLIC USE
- LIMITS OF IRRIGATED AGRICULTURAL LAND
- PROPOSED WETLANDS AREA, DUCKS UNLIMITED

NOTES

1. AREAS NOT DESIGNATED ON MAP ARE NON-IRRIGATED AGRICULTURAL LANDS
2. SEE MAP 6 FOR DETAILED INFORMATION ON IRRIGATED AGRICULTURAL LANDS FROM CLARK FORK RIVER
3. POPULATION INFORMATION COMPILED FROM MONTANA DEPARTMENT OF COMMERCE, CENSUS AND ECONOMIC INFORMATION CENTER, HELENA, MONTANA (1980 CENSUS)
4. ISOLATED RESIDENCES LOCATED THROUGHOUT THE STUDY AREA ARE NOT SHOWN

CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT
LAND USE AND DEMOGRAPHY

NO	DATE	REVISION

DES	SS	SHEET OF	1 3	MAP 5
DR	MP			
CHK	MG	DATE	5-15-87	
APPD	JG	DWG NO		

DRUMMOND
POP. ≈ 414

GOLDCREEK
POP ≈ 40

GARRISON
POP ≈ 100

APPROX. LIMITS OF
FORESTED AREAS

1 S 0 1
MILES

EXPLANATION

- ▲ PRIVATE CAMPGROUND
- △ STATE RECREATION AREA
- ● STATE FISHING ACCESS SITE
- ○ PUBLIC RECREATION AREA (OTHER THAN STATE)
- □ INTERSTATE 90 REST AREA
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- ⬟ WATERFOWL MANAGEMENT AREA / FISHING ACCESS MONTANA DEPARTMENT OF FISH, WILDLIFE AND PARKS
- ◯ AREAS WITH POPULATION DENSITIES GREATER THAN 20 PERSONS

- STATE OR FEDERAL LANDS AVAILABLE FOR PUBLIC USE
- LIMITS OF IRRIGATED AGRICULTURAL LAND
- PROPOSED WETLANDS AREA, DUCKS UNLIMITED

NOTES:

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4. ISOLATED RESIDENCES LOCATED THROUGHOUT THE STUDY AREA ARE NOT SHOWN

CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT
LAND USE AND DEMOGRAPHY

NO	DATE	REVISION
DES	SS	SHEET 2 3
DR	MP	OF
CHK	MG	DATE 5-15-87
APPD	JG	DWG NO

MAP 5

PILTZVILLE / TURAH
POP ≈ 600

POP ≈ 120

CLINTON
POP ≈ 150

ROCK CREEK
POP ≈ 30

APPROX. LIMITS OF
FORESTED AREAS

BEARMOUTH
POP ≈ 30

5 0
MILES

EXPLANATION

- ▲ PRIVATE CAMPGRDUND
- △ STATE RECREATIDN AREA
- ● STATE FISHING ACCESS SITE
- ○ PUBLIC RECREATIDN AREA (DTHER THAN STATE)
- □ INTERSTATE 9D REST AREA
- ■ HISTDRIC SITE
- ◊ PRDPDSED RECREATIDN AREA
- ⬟ WATERFDWL MANAGEMENT AREA / FISHING ACCESS MDNTANA DEPARTMENT DF FISH, WILDLIFE AND PARKS
- ◯ AREAS WITH PDPULATION DENSITIES GREATER THAN 2D PERSDNS
- STATE DR FEDERAL LANDS AVAILABLE FOR PUBLIC USE
- LIMITS DF IRRIGATED AGRICULTURAL LAND
- PRDPDSED WETLANDS AREA, DUCKS UNLIMITED

NDTES.

1. AREAS NDT DESIGNATED ON MAP ARE NDN-IRRIGATED AGRICULTURAL LANDS
2. SEE MAP 6 FDR DETAILED INFDRMATIDN DN IRRIGATED AGRICULTURAL LANDS FRDM CLARK FDRK RIVER
3. PDPULATION INFDRMATION COMPILED FRDM MONTANA DEPARTMENT DF COMMERCE, CENSUS AND ECDNDMIC INFDRMATIDN CENTER, HELENA, MDNTANA (198D CENSUS)
4. ISDLATED RESIDENCES LOCATED THRDUGHDUT THE STUDY AREA ARE NDT SHDWN

CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT
LAND USE AND DEMOGRAPHY

NO	DATE	REVISION

DES	SS	SHEET	3 3
DR	MP	OF	
CHK	MG	DATE	5-15-87
APPD	JG	DWG NO	

MAP 5

EXPLANATION

- IRRIGATED AREAS PRIOR TO 1955 (DEER LODGE CO.) AND 1959 (POWELL CO) OBTAINED FROM: STATE ENGINEER'S OFFICE, 1955 AND 1959, WATER RESOURCES SURVEY, DEER LODGE AND POWELL COUNTIES, HELENA, (THESE AREAS ARE ALSO CURRENTLY BEING IRRIGATED AS CONFIRMED BY INTERPRETATION OF 1983 E.P.A. AERIAL PHOTOGRAPHY)
- IRRIGATED AREAS SINCE 1955 (DEER LODGE CO.) AND 1959 (POWELL CO.) INTERPRETED FROM 1983 E.P.A. AERIAL PHOTOGRAPHY AND WATER RIGHTS CLAIMS ON FILE AT MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION
- HISTORICALLY IRRIGATED AREAS: INTERPRETED FROM 1983 E.P.A. AERIAL PHOTOGRAPHY (THESE AREAS ARE NOT CURRENTLY BEING IRRIGATED)

NOTES:
1. ONLY MAJOR IRRIGATION DITCHES SHOWN
2. AREAS SHOWN INCLUDE ONLY THOSE IRRIGATED WITH WATER FROM THE CLARK FORK RIVER

CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT
IRRIGATION

NO	DATE	REVISION
DES	SS	SHEET 1 OF 3
DR	MP	MAP 6
CHK	MG	DATE 5-15-87
APPD	JG	DWG NO

EXPLANATION

- IRRIGATED AREAS PRIOR TO 1959 (POWELL AND GRANITE CO.) OBTAINED FROM STATE ENGINEER'S OFFICE, 1959, WATER RESOURCES SURVEY, POWELL AND GRANITE COUNTIES, HELENA (THESE AREAS ARE ALSO CURRENTLY BEING IRRIGATED AS CONFIRMED BY INTERPRETATION OF 1983 E.P.A. AERIAL PHOTOGRAPHY.
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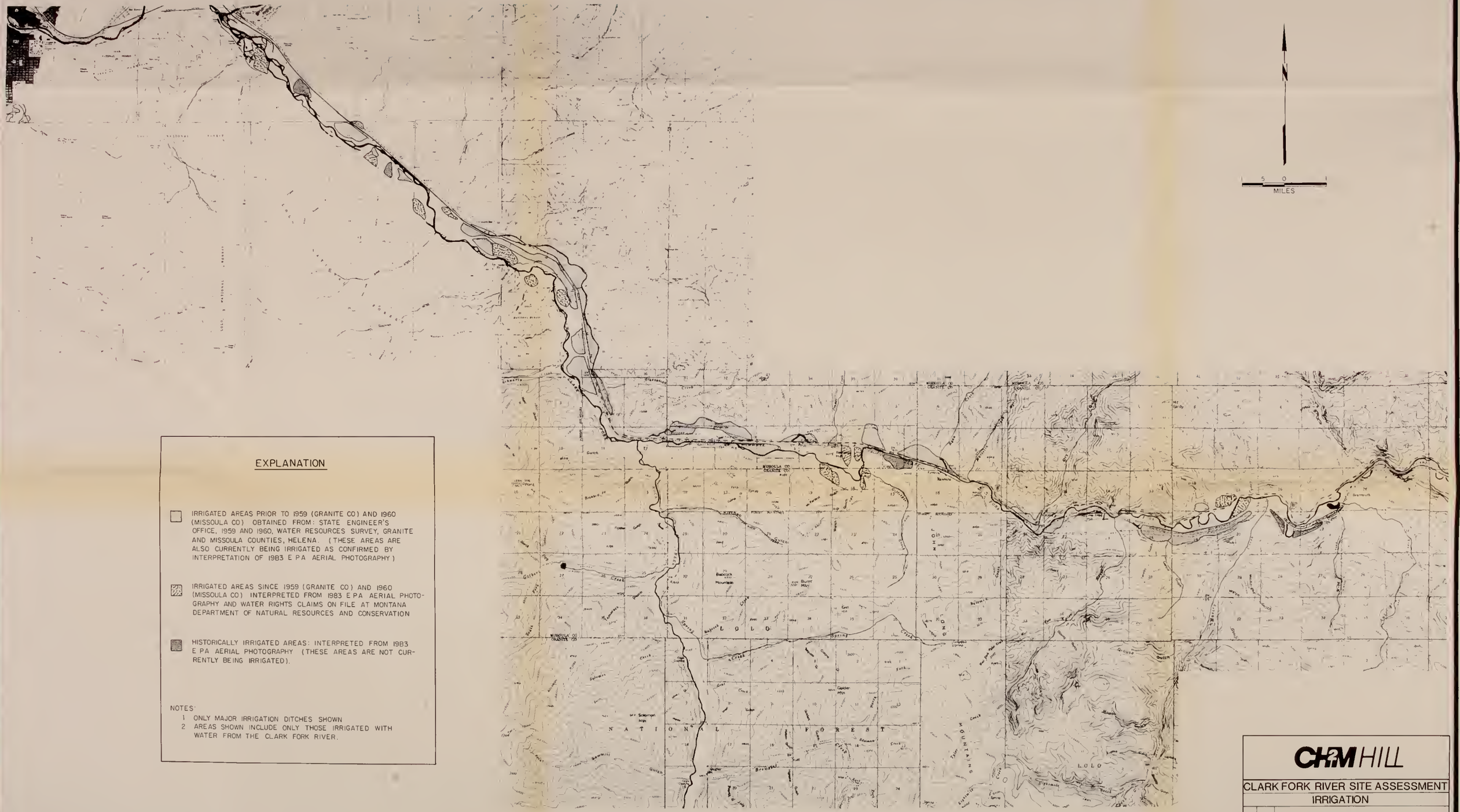
CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT

IRRIGATION

NO	DATE	REVISION

DES	SS	SHEET 2 OF 3		MAP
DR	MP			
CHK	MG	DATE	5-15-87	6
APPD	JG	DWG NO		



EXPLANATION

- ☐ IRRIGATED AREAS PRIOR TO 1959 (GRANITE CO) AND 1960 (MISSOULA CO) OBTAINED FROM: STATE ENGINEER'S OFFICE, 1959 AND 1960, WATER RESOURCES SURVEY, GRANITE AND MISSOULA COUNTIES, HELENA. (THESE AREAS ARE ALSO CURRENTLY BEING IRRIGATED AS CONFIRMED BY INTERPRETATION OF 1983 E P A AERIAL PHOTOGRAPHY)
- ▨ IRRIGATED AREAS SINCE 1959 (GRANITE CO) AND 1960 (MISSOULA CO) INTERPRETED FROM 1983 E P A AERIAL PHOTOGRAPHY AND WATER RIGHTS CLAIMS ON FILE AT MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION
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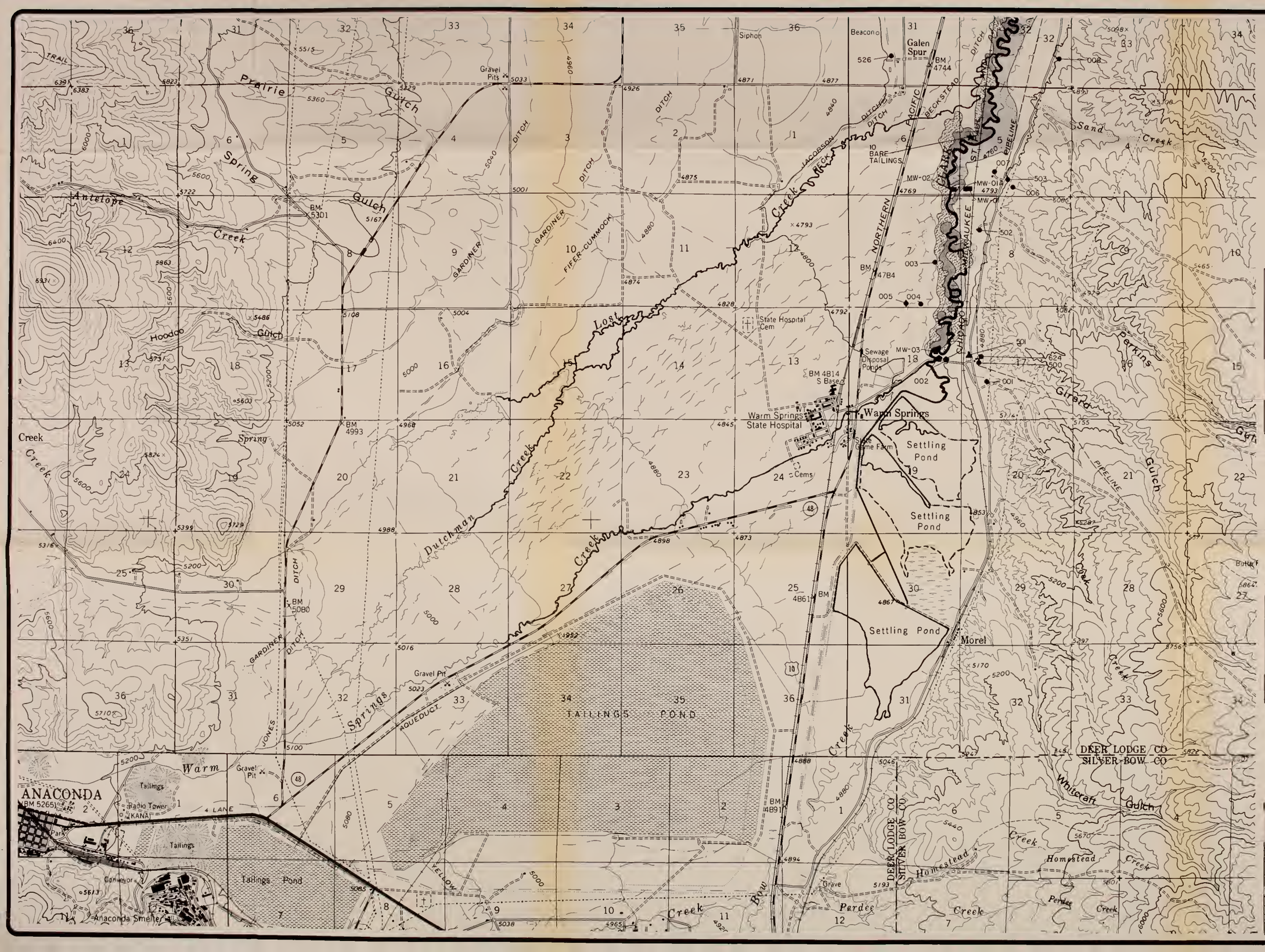
CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT
IRRIGATION

NO	DATE	REVISION

DES	SS	SHEET 3 OF 3	MAP 6
DR	MP		
CHK	MG	DATE 5-15-87	
APPD	JG	JAC NO.	



1M 0 1M 2M
FEET

EXPLANATION

- AQUOLLS, AQUENTS, SLICKENS COMPLEX CONTAINS 20-30% TAILINGS DEPOSIT WITH SPARSE VEGETATION
- TYPIC FLUVAQUENTS, SLICKENS COMPLEX CONTAINS 60-70% TAILINGS DEPOSIT WITH LITTLE OR NO VEGETATION
- SUSPECTED METALS ENRICHED SOILS
- ▲ DOMESTIC WELL SAMPLED JUNE/JULY 1987
- ● DOMESTIC, IRRIGATION OR MUNICIPAL WELLS
- ■ MONITORING WELL SAMPLED JULY, 1987 (Northern Engineering & Testing)
- ◆ U S G S MONITORING WELL
- ⬟ U S G S WATER QUALITY MONITORING WELL
- ★ CLARK FORK RIVER SITE ASSESSMENT; DETAILED SOILS INVESTIGATION SITE

NOTES:

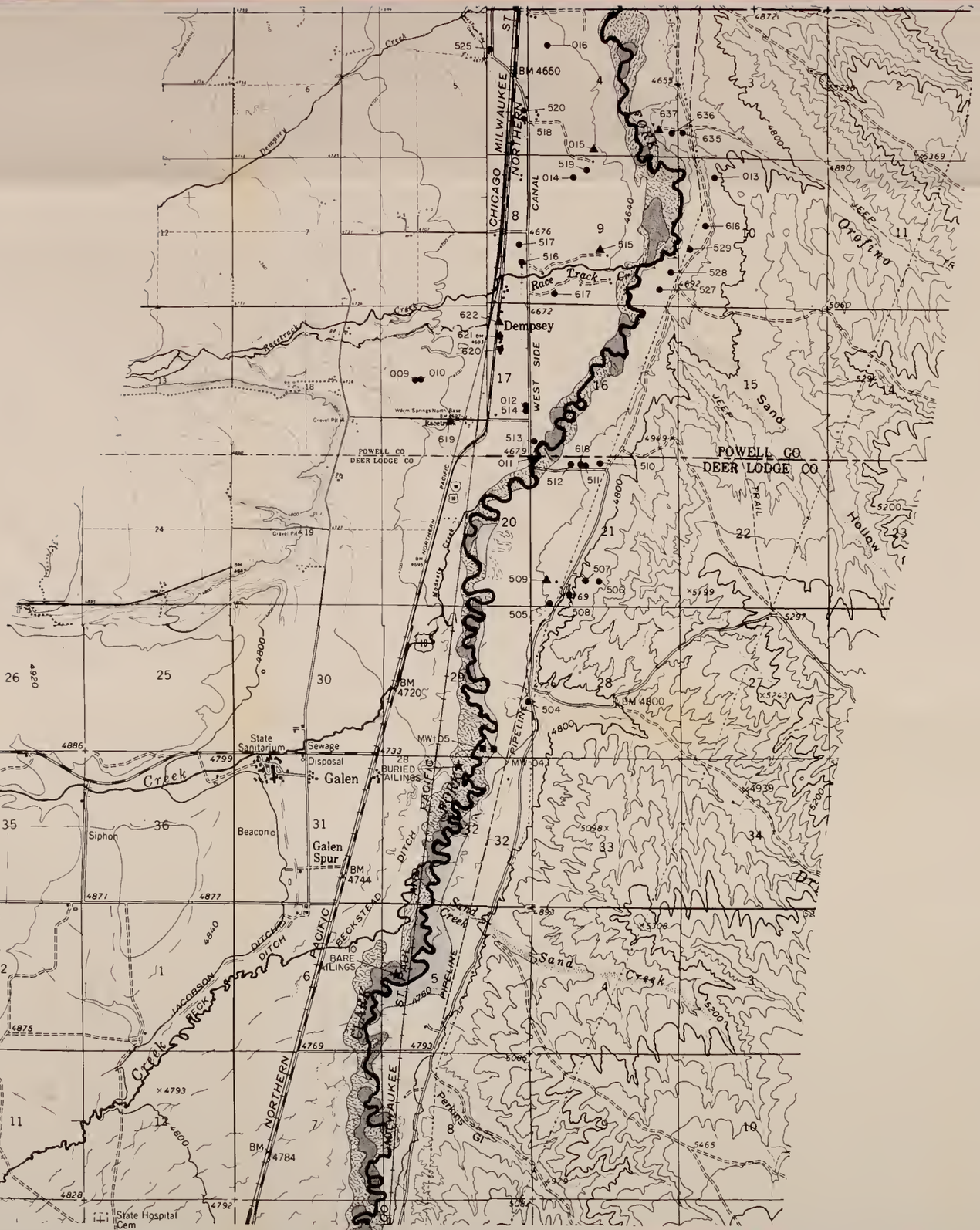
1. SOILS MAPPED AS AQUOLLS AND TYPIC FLUVAQUENTS ARE TAKEN FROM USDA, SOIL CONSERVATION SERVICE, DEER LODGE SOIL SURVEY OFFICE, MAPS SURVEYED IN 1978, UNPUBLISHED
2. AREAS SHOWN AS SUSPECTED METALS ENRICHED SOILS INTERPRETED FROM 1983 EPA AERIAL PHOTOS

CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT
TAILINGS AND WELLS

NO	DATE	REVISION

DES	SS	SHEET 1 OF 10	MAP	7
DR	MP			
CHK	MG	DATE 5-15-87		
APPD	JG	DWG NO		



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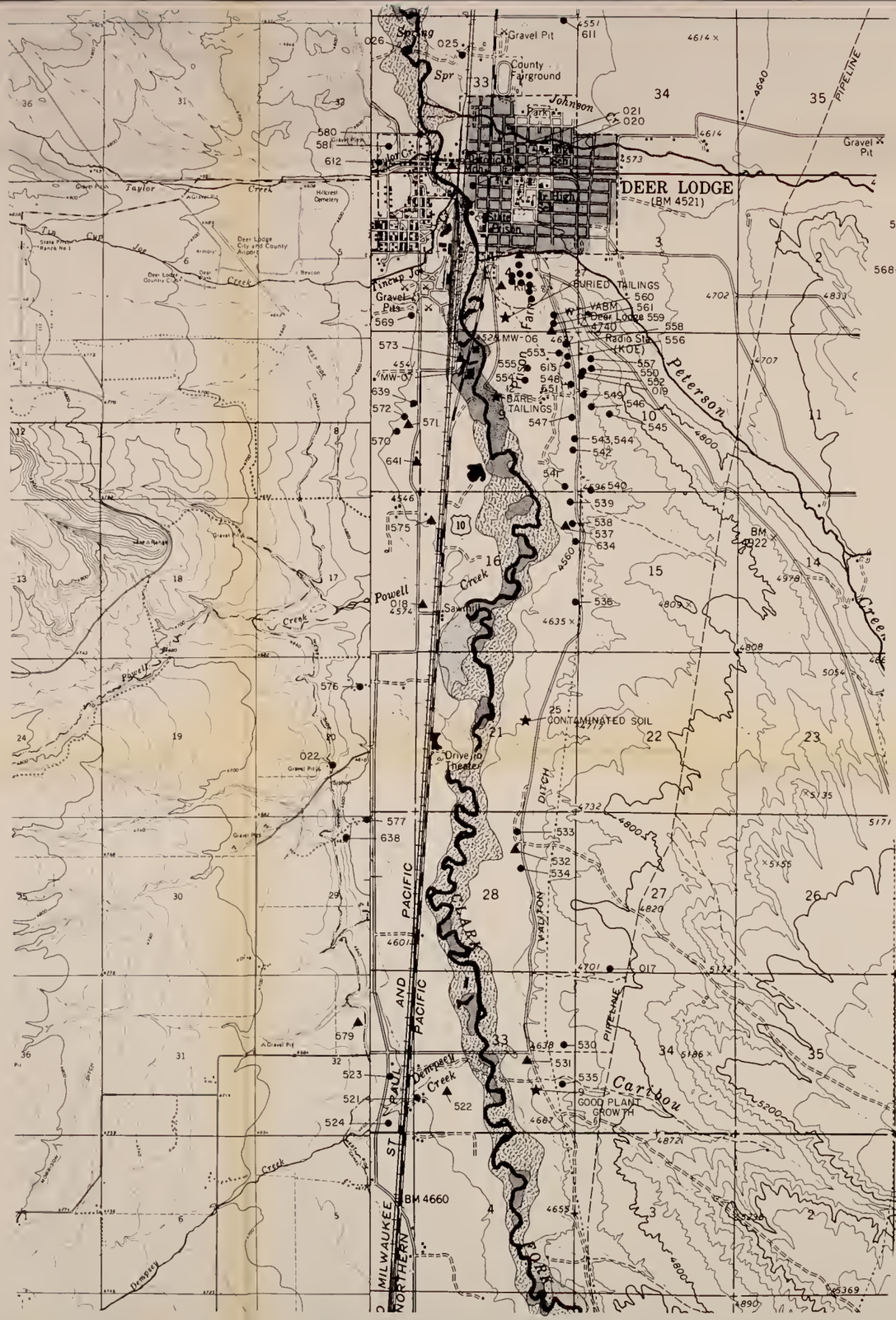
CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT
TAILINGS AND WELLS

NO	DATE	REVISION

DES	SS	SHEET OF	2 10
DR	MP		MAP 7
CHK	MG	DATE	5-15-87
APPD	JG	DRG NO	



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CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT
TAILINGS AND WELLS

NO	DATE	REVISION
DES	SS	SHEET 3 OF 10
DR	MP	MAP 7
CHK	MG	DATE 5-15-87
APPD	JG	DWG NO

1M 0 1M 2M
FEET

EXPLANATION

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CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT
TAILINGS AND WELLS

NO	DATE	REVISION

DES	SS
DR	MP
CHK	MG
APPD	JG
SHEET	4
OF	10
DATE	5-15-87
DWG NO	MAP 7

1M 0 1M 2M
FEET

EXPLANATION

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CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT
TAILINGS AND WELLS

NO	DATE	REVISION

DES	SS	SHEET 5	MAP 7
DR	MP	OF 10	
CHK	MG	DATE 5-15-87	
APPD	JG	DAD NO	

EXPLANATION

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1M 0 1M 2M
FEET

CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT
TAILINGS AND WELLS

NO	DATE	REVISION

DES	SS	SHEET 6 OF 10	MAP 7
DR	MP		
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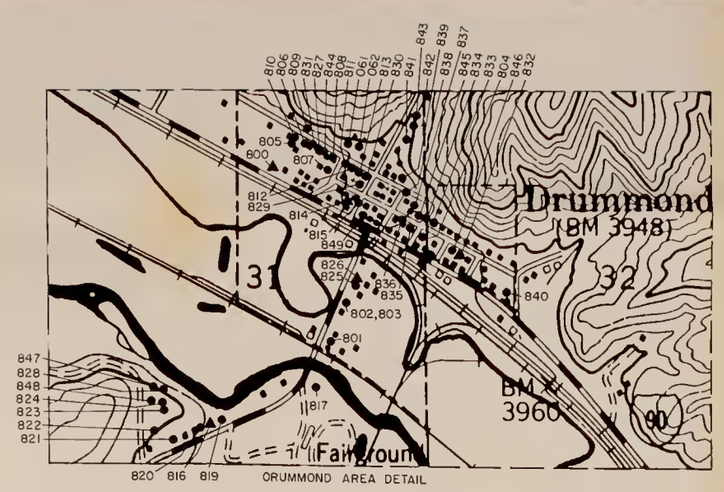


EXPLANATION

- AQUOLLS, AQUENTS, SLICKENS COMPLEX CONTAINS 20-30% TAILINGS DEPOSIT WITH SPARSE VEGETATION
- TYPIC FLUVAQUENTS, SLICKENS COMPLEX CONTAINS 60-70% TAILINGS DEPOSIT WITH LITTLE OR NO VEGETATION
- SUSPECTED METALS ENRICHED SOILS
- ▲ DOMESTIC WELL SAMPLED JUNE / JULY, 1987
- ● DOMESTIC, IRRIGATION OR MUNICIPAL WELLS
- ★ CLARK FORK RIVER SITE ASSESSMENT; DETAILED SOILS INVESTIGATION SITE

NOTES:

1 SOILS MAPPED AS AQUOLLS AND TYPIC FLUVAQUENTS ARE TAKEN FROM USDA, SOIL CONSERVATION SERVICE, DEER LODGE SOIL SURVEY OFFICE, MAPS SURVEYED IN 1978, UNPUBLISHED

2 AREAS SHOWN AS SUSPECTED METALS ENRICHED SOILS INTERPRETED FROM 1983 EPA AERIAL PHOTOS

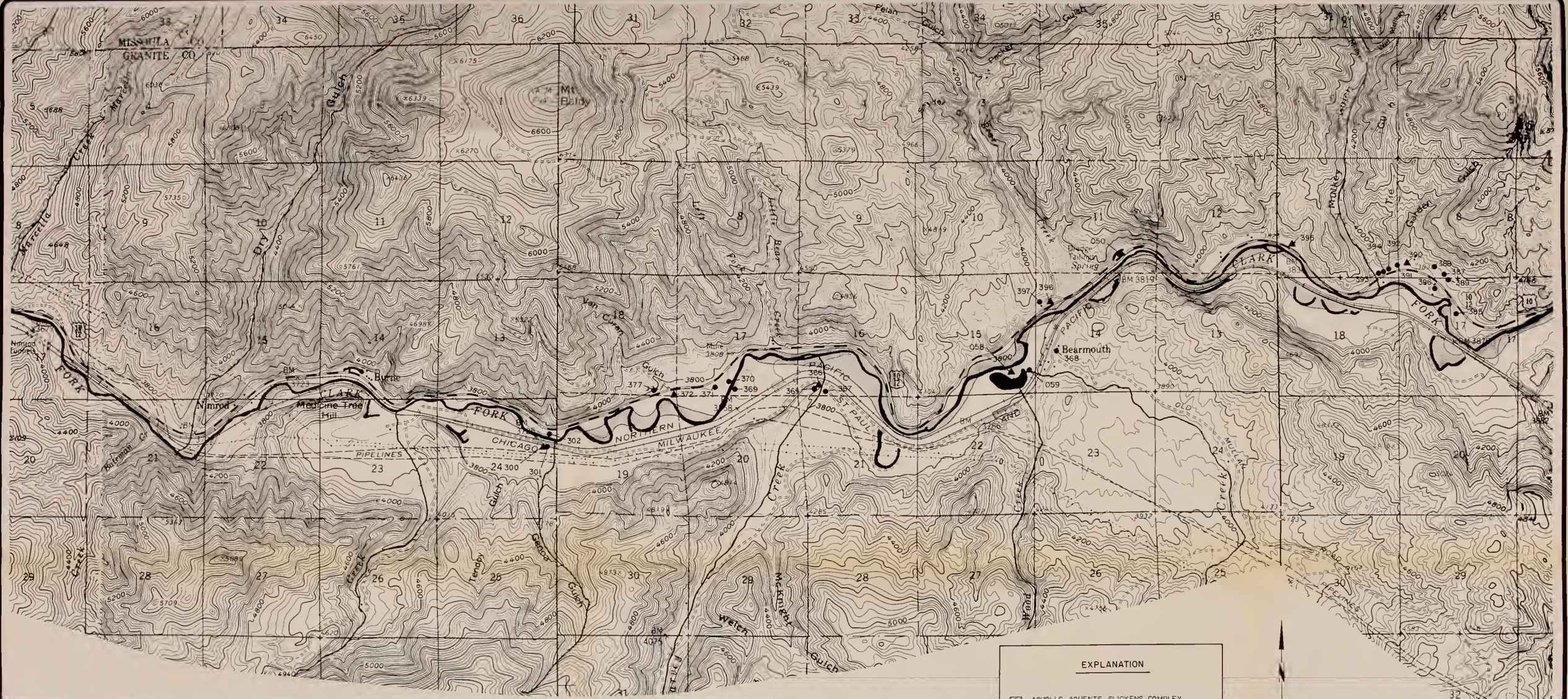
CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT
TAILINGS AND WELLS

NO	DATE	REVISION

DES	SS	SHEET	7	10
DR	MP	OF		
CHK	MG	DATE	5-15-87	
APPD	JG	DWG NO		

MAP 7



EXPLANATION

- AQUOLLS, AQUENTS, SLICKENS COMPLEX CONTAINS 20-30% TAILINGS DEPOSIT WITH SPARSE VEGETATION
- TYPIC FLUVAQUENTS, SLICKENS COMPLEX CONTAINS 60-70% TAILINGS DEPOSIT WITH LITTLE OR NO VEGETATION
- SUSPECTED METALS ENRICHED SOILS

NOTES:

1. SOILS MAPPED AS AQUOLLS AND TYPIC FLUVAQUENTS ARE TAKEN FROM U.S.D.A., SOIL CONSERVATION SERVICE, DEER LODGE SOIL SURVEY OFFICE, MAPS SURVEYED IN 1978, UNPUBLISHED
2. AREAS SHOWN AS SUSPECTED METALS ENRICHED SOILS INTERPRETED FROM 1983 EPA AERIAL PHOTOS.

- ▲ DOMESTIC WELL SAMPLED JUNE/JULY, 1987
- ● DOMESTIC, IRRIGATION OR MUNICIPAL WELLS
- ⬟ U.S.G.S. WATER QUALITY MONITORING WELL
- ★ CLARK FORK RIVER SITE ASSESSMENT; DETAILED SOILS INVESTIGATION SITE

CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT
TAILINGS AND WELLS

NO	DATE	REVISION

DES	SS	SHEET 8 OF 10	MAP 7
DR	MP		
CHK	MG	DATE 5-15-87	
APPD	JG	DWG NO	

CLINTON AREA DETAIL

EXPLANATION

- AQUOLLS, AQUENTS, SLICKENS COMPLEX CONTAINS 20-30% TAILINGS DEPOSIT WITH SPARSE VEGETATION
- TYPIC FLUVAQUENTS, SLICKENS COMPLEX CONTAINS 60-70% TAILINGS DEPOSIT WITH LITTLE OR NO VEGETATION
- SUSPECTED METALS ENRICHED SOILS

- ▲ DOMESTIC WELL SAMPLED JUNE / JULY, 1987
- ● DOMESTIC, IRRIGATION OR MUNICIPAL WELLS
- ⬟ U S G S. WATER QUALITY MONITORING WELL

N

1M 0 1M 2M
FEET

NOTES:

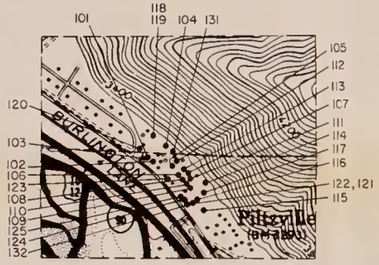
1. SOILS MAPPED AS AQUOLLS AND TYPIC FLUVAQUENTS ARE TAKEN FROM USDA, SOIL CONSERVATION SERVICE, DEER LODGE SOIL SURVEY OFFICE, MAPS SURVEYED IN 1978, UNPUBLISHED
2. AREAS SHOWN AS SUSPECTED METALS ENRICHED SOILS INTERPRETED FROM 1983 EPA AERIAL PHOTOS

CH2M HILL

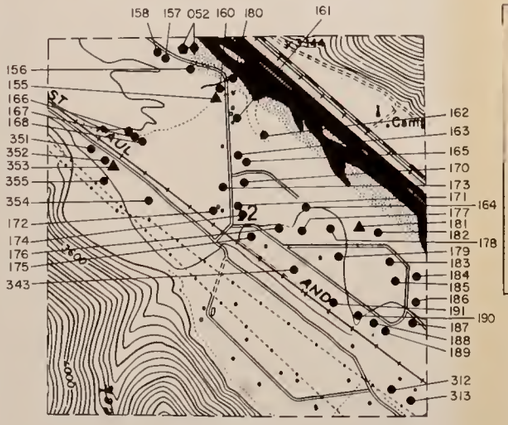
CLARK FORK RIVER SITE ASSESSMENT
TAILINGS AND WELLS

NO	DATE	REVISION

DES	SS	SHEET 9 OF 10	MAP 7
DR	MP		
CHK	MG	DATE 5-15-87	
APPD	JG	DAG NO.	



PILTZVILLE AREA DETAIL



SECTION 12 DETAIL

EXPLANATION

- AQUOLLS, AQUENTS, SLICKENS COMPLEX. CONTAINS 20-30% TAILINGS DEPOSIT WITH SPARSE VEGETATION
- TYPIC FLUVAQUENTS, SLICKENS COMPLEX. CONTAINS 60-70% TAILINGS DEPOSIT WITH LITTLE OR NO VEGETATION
- SUSPECTED METALS ENRICHED SOILS.

- ▲ DOMESTIC WELL SAMPLED JUNE / JULY, 1987
- ● DOMESTIC IRRIGATION OR MUNICIPAL WELLS
- ◆ U S G S MONITORING WELL
- ⬟ U S G S WATER QUALITY MONITORING WELL

NOTES

1. SOILS MAPPED AS AQUOLLS AND TYPIC FLUVAQUENTS ARE TAKEN FROM U.S.O.A., SOIL CONSERVATION SERVICE, OEER LODGE SOIL SURVEY OFFICE, MAPS SURVEYED IN 1978, UNPUBLISHED
2. AREAS SHOWN AS SUSPECTED METALS ENRICHED SOILS INTERPRETED FROM 1983 E.P.A. AERIAL PHOTOS

1M 0 1M 2M
FEET

CH2M HILL

CLARK FORK RIVER SITE ASSESSMENT
TAILINGS AND WELLS

NO	DATE	REVISION

DES	SS	SHEET	10	10
DR	MP	OF		
CHK	MG	DATE	5-15-87	
APPD	JG	D'NG NO		

MAP 7